

SCIENCE

NEW YORK, APRIL 24, 1891.

GAME-PRESERVATION IN GERMANY.¹

OBSERVANT Americans, travelling by rail through Germany during the late summer or autumn months, are often astonished by the abundance of hares, partridges, and pheasants, which are to be seen in the fields and thickets along the railways, or by roe-buck — from two to a dozen or more together — feeding in pastures and meadows, and scurrying into the adjacent woods on approach of the train. This surprise is usually augmented when, at some country station, the traveller sees a party of sportsmen returning to town with the proceeds of a day's shooting. Remembering the denuded condition of the older and more thickly settled portions of our own country in all that respects field and woodland game, the impression is apt to come home to the transatlantic tourist that in this respect, at least, the Germans manage better than we have done. In fish-culture and the skilful breeding of many kinds of animals, the Americans are unsurpassed, if equalled, by any people of Europe; but, in making marketable game a plentiful product of fields that have been cultivated since many centuries before America was discovered, the Germans have, it would seem, set an example which we may study with interest, if not profit.

It is proposed in the present report to consider the German system of game protection and management from a purely economic standpoint. Aside from all consideration of shooting as a fascinating, healthful sport for men who are ordinarily confined to the wear and fatigue of city life, there is the practical question whether the growth of wild game may not, under proper conditions, be made to add in America, as it does so largely in Europe, to the annual cash product of fields and woodlands, even in the most thickly settled States and in the vicinity of large cities.

It was but natural that a people busy with the task of clearing and settling a country so vast as ours should, until within recent years, have regarded game birds and animals as part of the spontaneous product of the land, the property of whoever might take the trouble to pursue and kill them. Not within many centuries has any such easy-going indifference on that subject prevailed in these older nations of Europe. From the days when the game belonged to the crown, and hunting was the exclusive privilege of the king and the nobility, game birds and animals have been recognized as property not less tangible and defensible than domestic poultry or cattle.

With the imperial preserves of Germany and the vast estates of the wealthier aristocracy, where stags and pheasants are reared and tended by liveried game-keepers for wholesale slaughter on princely hunting-days, the present report has, for obvious reasons, no concern. All that belongs to a social and political condition so remote from our own as to divest it of all practical interest in this connection. But the imperial and grand ducal preserves cover but a small proportion of German territory. The vast bulk of it is possessed by individual farmers and communes, and is leased, so far

as shooting privileges are concerned, to individuals or small clubs of professional and business men in the neighboring towns and cities for an annual rental, which amounts in the aggregate to many millions of marks, and constitutes one of the important revenues of the agricultural class. In no respect are the provincial governments of Germany more jealous of national interference than in regard to their game-laws. Prussia, Bavaria, Hesse, Württemberg, and Baden have each their separate code for the protection of game and the regulation of shooting privileges; but, as it will be impossible to consider them all within reasonable space, we may fairly select as an example the code of Prussia, which is as fair and intelligently framed as any, and will serve to illustrate the system which has proved so successful and advantageous in this country.

One of the important provisions of the Prussian code is that which permits any proprietor of landed property to kill game at proper seasons in any part of his premises that may be enclosed by a fence or wall, but which denies him this privilege on any piece of unenclosed land which is less than two hundred acres in extent. In the latter case the game on the farmer's land reverts to the care of the commune in which he lives, which rents the shooting privileges of all such territory within its limits, crediting to each farmer his due share of the aggregate rental, proportionate to the area of his land.

As nearly all farming-lands in Germany are owned in small tracts by peasant farmers who live in villages, and as such lands are rarely or never enclosed by any semblance of hedge or fence, it follows that most field-shooting is leased by the communal authorities at prices which vary from twenty to seventy-five cents per acre annually, thus adding an additional crop, so to speak, to the yearly product of the ground. These shooting privileges are leased usually for terms of six, nine, or twelve years. Competition is by auction at the office of the communal burgomaster, and the lease goes to the highest bidder who can furnish satisfactory guaranties as to financial responsibility. The lessee then becomes responsible, not only for the proper care of the game in the fields and woods covered by his lease, but also for whatever damage the game may inflict upon growing crops. Should the hares injure the beets and turnips, or the deer from the adjacent forest trespass upon the wheat or rye fields, the farmer summons the two communal assessors appointed for that purpose, who examine the premises, and estimate the amount of damage which the lessee of the shooting is required to pay. If he finds the tax excessive, he may nominate a third member of the board, and call for a re-appraisal of the damage. The lessee also employs a local game-keeper, who earns a yearly salary ranging from two hundred dollars to three hundred dollars, and whose business it is to look after the game, kill foxes, hawks, and other carnivorous creatures, and prevent poaching.

Nothing could better illustrate the universal respect for the rights of property in this country and the absence of that lawless, predatory spirit which pervades some less strictly governed communities, than the entire immunity from irregular depredations which is secured to partridges, pheasants,

¹ Report by Consul-General Mason of Frankfort, dated Jan. 3, 1891.

hares, rabbits, and other small game, even in the immediate neighborhood of populous German villages. The peasant farmer is satisfied with a system which secures to him a full cash value for all the game which his land may produce, as well as prompt payment for whatever damage the same may inflict upon his crops, and at the same time protects his fields from trespass by unauthorized persons or at seasons when the grain and grass might be injured thereby, for the game-laws carefully prohibit field-shooting until such crops are gathered.

An important feature of the protective system is the law which forbids any person from hunting or using a gun unless he is provided with the legal *Jagdpass*, or license. This license is issued by the local magistrate in each district to applicants of good standing, who must be not less than eighteen years of age, and, if under twenty-one years, must be vouched for by some responsible person. The pass is for one year, costs from seventy-five cents to three dollars, according to the varying regulations of the different provinces, and bears on its reverse side a checkered design showing the open and close months of the year for each kind of game. To be found outside of one's own premises with a rifle or fowling-piece and without a *Jagdpass* involves the confiscation of gun and accoutrements. This arrangement effectually eliminates the professional poacher and the predatory small-boy with the cheap shot-gun, who have been so destructive to singing-birds, as well as to furred and feathered game, in some other countries.

The game birds and animals of Germany include principally the stag, the fallow-deer and roe-deer, hares and rabbits, the capercaillie (or *Auerhahn*), pheasants, partridges, snipe, woodcock, wild ducks and swans, and several other varieties of birds, not to speak of fish-otters, foxes, and badgers, which are killed for their fur, or because they are destructive to fish and smaller game.

Keeping still in view the economic aspects of the subject, the practical question would be, which of these varieties might be most easily transplanted to the thickly settled portions of the United States, and grown there under conditions similar to those which exist in Germany. The climate of this country does not differ essentially from that of the Northern and Middle States of our Republic. With the exception that the proportion of woodland to open fields is larger with us than here, and that the American farmer keeps his land enclosed by fences, and lives on it instead of in a neighboring village, the principal conditions are nearly similar. The proportion of pasture and meadow to ploughed land is greater in most American districts than in Germany, but this would be to the advantage of the game rather than otherwise. In most States of the Union the laws distinctly recognize the right of the land-owner to the game birds and animals on his property, and enable him to defend that right against trespass. There would seem to be no reason why at least four of the species which are now grown so abundantly for sport and profit in Germany should not be at least equally successful in almost any part of the United States. These are the pheasant, the gray partridge, the hare, and the roe-deer, all of which live and thrive in proximity to man, and may be easily transferred to any locality suitable to their existence.

The gray partridge (*Rebhuhn*) of northern Europe is in size about midway between the quail and prairie-chicken of the United States, the former of which he strongly resembles in appearance and disposition. Although less beautiful than the red-legged partridge of southern Europe, he is not less

"gamy" in the field or delicious on the table, his flesh resembling strongly that of our native quail. This species lives in the open fields and meadows of Germany, even close to the villages and farmhouses, and subsists at all times upon food precisely similar to that of the American quail and prairie-chicken. The female lays in May or early June from sixteen to twenty eggs, and, if foxes, weasels, or cold, protracted rains destroy her young brood, she makes another effort and brings forth her second hatching in July. The partridge-shooting season begins in Prussia on the 1st of September, by which time the young birds, except those of the second hatchings above noted, are well feathered, strong on the wing, and nearly full grown. Each brood forms a covey, and, like the prairie-chicken, they are at first tame and comparatively easy shooting, but with experience and the advancing season they become wilder and stronger; so that, although they are always "game," and lie well to a dog, particularly when approached from leeward, they are in later October and November sufficiently difficult to satisfy the most exacting sportsman. Partridges sell in the market at from fifty to seventy-five cents each, and, although killed in immense numbers, are always in demand. It is no unusual thing in this region to kill during a season two or three hundred birds on a farm not exceeding a hundred and fifty acres in extent; and there are several preserves in the open fields along the Rhine, between Mayence and Mannheim, where the average annual score exceeds a thousand.

It is, of course, quite at variance with American or English ideas for a sportsman to sell his game or consider in any way its market value, but in Germany no such squeamishness prevails. The product of each day's hunt, except what the master wants for his own use or chooses to present to friends, goes to the game-dealer, who has a standing contract with the sportsman to take his entire product at prices agreed upon in advance, and which are rigidly adhered to.

Until within a few years most sportsmen who leased shootings in this part of Germany could pay their rent and hire of gamekeeper, and even save a profit, from the proceeds of their game. This enabled many men of limited means to lease lands which would have been quite beyond the reach of their unaided private incomes, and thus practically the whole territory — woods, field, marsh, and mountain — was then, as now, leased for shooting purposes. But, with the rapid increase of wealth and the growth of the class of men able to afford the luxury of hunting, the competition for the best grounds has become so sharp that the rental has advanced enormously within a short period, so that comparatively few shooting leases are now self-supporting; that is, paying by sales of game the cost of rent, game-keeper, and damage by game to growing crops. Many shooting privileges in this region which were leased at auction during the past year have brought three times the rental of the previous lease made six years ago, and some communes now pay their local and national taxes from the revenues thus easily obtained. When it is considered how burdensome taxation has become to the German peasantry, the advantage of being able to pay this obligation in hares, partridges, and pheasants grown spontaneously on their lands will be at once apparent.

The pheasant of Germany is identical with that of England, France, and Austria, and is an exotic in Europe, having been brought many centuries ago from its native haunts in the Himalayan districts of India, by way of Asia Minor, into European Turkey, Austria, and particularly Bohemia, where it is now found wild in immense numbers. The

pheasant is a showy bird, of moderate merit for the table, except as an ornament, but nevertheless much esteemed for its beauty and for the easy, comfortable shooting that it affords. Pheasants are easily bred in this region from birds or eggs obtained from Bohemia, where the females cost from one dollar and seventy-five cents to two dollars each, the cocks, in the proportion of one to eight or ten hens, costing somewhat less.

Any person who has a few acres of thick wood with underbrush or open thicket sufficiently tall to furnish good cover has the necessary conditions for growing pheasants, which subsist on wild berries, buds, and the grain that they pick up in the adjoining fields. During hard winters, when the snows lie long and deep on the ground, careful sportsmen keep their pheasants within limits by feeding them grain; but there is in this part of Germany, so far as can be learned, none of that wholesale growing of pheasants in parks like chickens, that is so common and so costly on the great manorial estates of England.

The cock pheasant may be lawfully shot in Prussia during the whole year, except June, July, and August; the female, only from the 1st of September until the end of January. In most preserves the hen pheasants are rarely or never killed unless the stock becomes too numerous, which it may easily do unless the birds are preyed upon by foxes, hawks, and weasels, which are the persistent enemies of game in most parts of Germany. For this reason foxes, cats, and even stray dogs found at large upon land rented for shooting purposes, may be, and usually are, killed at sight. Aside from its natural enemies, the pheasant is a prosperous and prolific bird, and there would seem to be no reason why it should not thrive abundantly in almost every part of the United States. Birds and eggs for breeding purposes may be obtained in almost any quantity from dealers in Bohemia; but, as the demand is considerable from France, England, and western Germany, it is often requisite to give the order some weeks in advance of the laying season, which is in April and May.

The roe-deer is the smallest and most nearly domesticated of the three species of deer which inhabit Germany. It is likewise the most beautiful, and its flesh is the daintiest venison known to the epicure. In color, form, grace, and fleetness it resembles more nearly the antelope than other species of deer. It lives abundantly throughout the forests of central Europe, but prefers thickets of underbrush in the vicinity of open fields and meadows to the darker and denser woods which form the haunts of the stag and fallow deer. It is this tractable, half-domesticated disposition, its willingness to live in close proximity to the homes of men, that makes the roe-deer the valuable game animal that it is. It is no unusual circumstance to find from six to a dozen of these shy, graceful creatures living in a piece of woodland less than thirty acres in extent, and they are so abundant in this region that hunting parties frequently kill in a single day within ten miles of Frankfort anywhere from ten to forty of them. The roe-buck may be killed throughout the year, except during March and April; but the doe is protected by law ten months out of twelve, and may be shot only from the 15th of October to the 15th of December. The buck sheds his horns in December, and from that time until May looks so much like a doe that he is comparatively safe from sportsmen; but in the early summer he is again in season, and until September, when the stag and the partridge shooting begins, he has the hunters practically to himself. Roe-deer which live in the neighborhood of culti-

vated fields often inflict damage upon the growing wheat and rye; but this the thrifty peasant takes immediate note of, and, under the law already noted, assesses the damage upon the lessee of the shooting title. For this reason some of the best hunting leases command but a small rental, and I know of one instance in which a sportsman pays only 150 marks (\$35.70) per annum for the rent of nearly a thousand acres, but distributes each year from \$1,000 to \$1,200 among the neighboring peasants for the damage done to their crops by his hares and deer. This occurs generally in districts where the proportion of wooded land to arable fields is but small; but the law which holds the game proprietor responsible for its depredations is an eminently just one, and takes from the farmer all temptation to destroy the game in self-defence.

But the plain, reliable, every-day game of the average German sportsman is the hare. It resembles in appearance the brown American rabbit, but is much larger, and its flesh is decidedly superior; moreover, the hare, unlike the rabbit, never burrows, but lives wholly above ground, inhabiting the bleak fields in winter, with no other lair or shelter than a small open hollow scooped out beside a protecting clod or stone. More rarely the hare inhabits thickets and small woodlands adjacent to farms, but in deep, dark woods he is seldom found, and never in any great numbers. But in the open fields of southern and western Germany the hare swarms in such profusion as to form one of the definite products of the land. Although not entitled to high rank as game, either for the table or the sportsman, the hare is a coveted luxury to the poor and middle classes, and in some markets, notably that of Paris, is always in demand. At the same time it offers to the sportsmen a pot shot sufficiently attractive to amuse the most competent, and not so difficult as to discourage the inexperienced, gunner.

The mother-hare bears annually two, sometimes three, litters of from eight to a dozen leverets, which, although decimated by cold, wet weather, and preyed upon by foxes, hawks, and other enemies, still make a brave struggle for life; so that by September, when the shooting season begins, they are as plentiful as field-mice. Except for the few that are shot during the partridge-hunting, hares are not killed to any great extent until December, when the great *battues*, or drive hunts, are made, which supply the winter market. Although much less destructive to gardens and young trees than our rabbit, the hare is so prolific that, unless kept in check by judicious hunting, he might soon become a source of anxiety to the farmer. In view of this, the law provides that the lessee of field-shooting in Prussia shall drive-hunt the entire area of his lease not less than once in each year. Accordingly, the whole agricultural territory must be shot over by the *Treibjagd* process annually, and the operation is often repeated when the first hunt has left too large a surplus of hares for the next year's breeding. Drive-hunting for hares is not, perhaps, an exalted form of sport; but it is always sociable and jolly, and has the further advantage that it gets the hares.

For a well-organized hunt of this kind, from fifteen to thirty sportsmen are requisite, with twice as many men and boys from the neighboring villages, who are marshalled by the game-keeper to serve as beaters to drive the game. The fields or woods are then taken by sections as large as the line of hunters and drivers can surround, and, although with skilful shooting more or less game always gets through the line and escapes, the slaughter is often enormous. It is no uncommon occurrence for a party like this to kill in a

short winter day, upon 300 or 400 acres of wheat and beet fields within half an hour's drive of Frankfort, from 400 to 500 hares. As they average in winter about eight pounds in weight, the result of such a day's shooting would be nearly or quite two tons of game, — a quantity which it would be, of course, impossible to dispose of otherwise than by sale. Game killed in such quantities must either be sold or wasted; and in this country, where waste is considered sinful, the hares or deer or partridges, as the case may be, are turned over to the game-dealer, who during the season loads daily a special car for the Paris market. The game-dealer pays from fifty to seventy-five cents each for hares in Germany: they retail for from five to seven francs in Paris. The French capital pays yearly millions of francs for game brought from beyond the Rhine. By the sale of his game, the lessee of shooting-grounds recoups, more or less fully, his expenditures for rent and keepers, and the money goes finally to the peasant or landed proprietor upon whose premises it was grown. From the beginning of the hunting season until the end of December, 1890, there have been killed in Prussia alone, according to official statistics, 2,500,000 hares, which, at 2.50 marks each, the usual wholesale price, represent an income of 6,250,000 marks, or nearly \$1,500,000.

The invitations which are exchanged between sportsmen to make up the number of guns requisite for a drive-hunt constitute an important form of social courtesy in Germany. The entertainment always includes a mid-day breakfast, more or less luxuriantly served at the tavern in the nearest village or upon tables spread in the woods by servants, who bring warm dishes, wines, etc., from the home of the host in the city.

Such, in substance, is the German system. Could it be introduced successfully and profitably in the United States, and, if so, would such introduction prove desirable? Competent judges who have given the subject careful thought answer both these questions in the affirmative, and say that the game-laws of several Northern and Eastern States are already adequate to render the raising of game in the woods and fields of ordinary farms sufficiently secure to insure a successful result. A system which would add an additional crop to the farmer's fields and forests, and thereby increase substantially his cash income from his land, would certainly not lack support from the agricultural majority which controls most State legislatures.

There are, of course, many questions of detail which such an experiment would involve, and into which it is impossible at present to enter; but, after all that has been so successfully done in our country to restock the inland lakes and streams with fish, there ought to be some way of restoring in a measure the game birds and animals which were formerly so abundant, and which have become, through indiscriminate shooting, so rare to the sportsmen, so costly in our markets. This can only be done by making game-preservation easy, inexpensive, and withal profitable to owners of the land. The German system has made game abundant throughout the empire, and yields an important income to the class which is in most need of it.

The experiment in America would need to be systematic, but not necessarily expensive. A dozen pairs of partridges, pheasants, and hares, imported from Germany or Austria, turned loose on almost any American farm, and protected from molestation three or four years, would multiply so that they would thereafter hold their own against any reasonable and sportsman-like pursuit. The larger the territory in-

cluded in such experiment, the more certain would be its success. There is the disastrous experience of Australia with the English rabbit, which might make some American farmers timid about introducing the hare; but it must be remembered that the European hare is a very different animal from the rabbit of either Australia or America. Besides being far less destructive and prolific than the rabbit, the hare does not burrow, and being, therefore, always above ground and accessible, its numbers can be easily kept within safe and reasonable limits.

NOTES AND NEWS.

ON Thursday, May 21, the second annual banquet is to be given at the Mercantile Club, St. Louis, in honor of Henry Shaw, the founder of the Missouri Botanical Garden and the Shaw School of Botany.

— Dr. G. Baur will leave, May 1, for the Galapagos Islands, to be absent for six months. He intends to make the most careful examination of the fauna and flora of every island.

— At the annual commencement of the Jefferson Medical College, Philadelphia, on April 15, the honorary degree of doctor of laws was conferred on Dr. Daniel G. Brinton, in recognition of the merit of his researches in anthropology and ethnology.

— An international agricultural congress, says *Nature*, will be held at the Hague in September next, from the 7th to the 12th. A commission will be appointed at the Hague to arrange for the reception of the members.

— Dr. E. D. Warfield, at present the president of Miami University, has accepted the position of president of Lafayette College at Easton, Penn. Dr. Warfield, who is but thirty-two years old, graduated with high honors from Princeton in 1882, and afterward from Oxford University, England.

— A meeting of the New York members of the American branch of the English Society for Psychical Research will be held, April 24, at 8 P.M., in Room 15, Hamilton Hall, Columbia College. Dr. Richard Hodgson, secretary of the American branch, will read "Narratives received by the Secretary." All persons interested are invited to attend.

— Bulletin No. 9 of the Agricultural Experiment Station of the Rhode Island State Agricultural School, Kingston, Washington County, R.I., is devoted to a record of experiments in apiculture, including the following subjects: "Artificial Heat for promoting Brood-Rearing;" "Hive on Scales, and Sources of Honey;" "Carniolan Bees;" "Foul Brood, its Cause, Prevention, and Cure." Samuel Cushman is the apiarist of the station.

— According to a telegram sent through Dalziel's Agency, a magnificent grotto has been discovered near Ajaccio. As described in *Nature*, it is entered with difficulty, owing to the smallness of the aperture; but upon his entrance, the explorer finds himself in a vast and lofty hall, the sides of which are some twenty-five yards in height. From this there are several passages leading to an indefinite number of other chambers. A thorough investigation of the grotto has not yet been made.

— Dr. Jordan, president of Stanford University, at Palo Alto, Cal., has completed arrangements for the appointments to the faculty of the university, and has made the following selections public: Dr. Andrew D. White, ex president of Cornell University, to be the non-resident professor of history; E. Stanford of Lake Forest University, to be the associate professor in physics; Horace B. Gale of Washington University, St. Louis to be professor of mechanical engineering; Professor Joseph Swain of Indiana University, to be the associate professor of mathematics; Douglass H. Campbell of Indiana University, to be the associate professor in botany.

— The following are some results of a study of 197 thunderstorms in Russia in 1888, with reference to their speed of travel, as given in *Nature* of April 2. The author (Herr Schönrock) obtained as mean velocity about 28.5 miles an hour, with variation

from 13 to 50 miles. In the hot season the velocity was less than in the cold (28 miles against 32 miles). It was least in the early morning, then increased, at first slowly, then faster, reaching a maximum between 9 and 10 P.M. Thunder-storms travel most quickly from south-west, west, and north-west. An interesting geographical difference was observed. From west to east the velocity increased at first; but about 30° to 35° east longitude a maximum was reached, and farther east the speed declined; the decline showing, however, a secondary maximum between 45° and 50°.

— With reference to observed changes in the earth's axis of rotation, says *Nature*, it has been pointed out that through changes in distribution of air-pressure and movement of water-masses, considerably differences of level in the ocean may be produced. Herr Lamp notes the displacement northwards of the maxima of air-pressure in the trade-wind region, and of ocean-currents, as the sun rises in summer. Thus a certain quantity of water passes over in summer from the southern to the northern hemisphere; and it is improbable that compensation takes place by means of undercurrents. As the year advances, water passes back to the southern hemisphere, reaching there a maximum in our winter. This periodical transference of mass is supposed to cause periodical variation in the earth's axis. Herr Lamp calculates that to cause a change of latitude of 0.5", it would be sufficient, that, at 180° longitude from Berlin, a water-mass of 2,500 cubic metres should move in a meridional direction from 30° south latitude to 35° north latitude; and that, with reference to the oceanic area concerned, we need only suppose a mean elevation of 10 centimetres (or 4 inches) in the sea level.

— The annual report of the Berlin branch of the German Meteorological Society contains the results of rainfall observations at a number of stations in and near Berlin for the year 1890. This year is among the driest experienced since 1848, when regular observations were begun. The months of February and September, especially, are the driest on record. Dr. Hellmann, the secretary, has carried on some useful experiments to determine the influence of the height of rain-gauges upon the records of rainfall, — a matter of considerable importance in towns, owing to the difficulty of obtaining a good exposure at a low level. He finds, according to *Nature* of April 2, that about a quarter of the rainfall is lost in an elevated exposure, such as on the roof of a house, during strong winds; but he arrives at the important conclusion that an elevated exposure is permissible if the gauge can be protected from the disturbing influence of the wind. The report also contains a list of the severe winters since 1728. The coldest winter was 1788. On Dec. 28 a minimum of -21.6° was recorded.

— A new method has been devised and patented in England for ascertaining the requisite time of exposure in photography. An instrument for measuring the relative intensity of the photographically active rays reflected from any landscape or other object by observing the time required for the light from a phosphorescent compound to fade from its maximum intensity to the intensity of the light reflected from the object, is employed. It consists, according to *The Engineering and Mining Journal*, of an opaque tube with an eye-piece at one end; while at the other is a plate of glass, part of which is coated with Balmain's paint, or some similar phosphorescent substance emitting only rays which act upon an ordinary photographic plate. The paint must either be opaque, or must be made opaque by means of a backing. Behind this glass is a piece of ground-glass, and there may also be a piece of blue glass cutting off from the light reflected from the object all rays except those which act on a photographic plate. The frame carrying these glasses is hinged, so that it can be turned back in order to expose the phosphorescent substance to light. When a measurement is to be made, the frame is turned back and the phosphorescent surface is exposed to daylight, or to the light from burning magnesium, for a time sufficient to excite the maximum luminosity. It is then put back in position, and the apparatus is at once directed toward the object to be photographed. The light reflected from this object passes through the unobstructed portion of the ground-glass and blue glass, and at first appears dark as compared with the light from the phos-

phorescent surface. The brightness of the latter, however, gradually fades, until the two lights are equal in intensity. The time required for this to take place is observed, and, with this datum and a series of tables supplied with the instrument, the exposure necessary to obtain a good photograph of the object in question is ascertained.

— Steps are being taken in Paris to prepare the way for the holding of an international colonial exhibition next year on the Champ de Mars. According to the Paris correspondent of the *London Times*, the sections would be geographical, not political; all the West Indies, for instance, forming one section, all India another, and so on. Specimens of all the native populations would be brought over and housed as at their homes, and two congresses — a colonial and an ethnographical — would be held.

— The mineral hornblende has been artificially reproduced in well-formed crystals by M. Kroustchoff, and an account of his experiments is communicated to *Comptes Rendus*, an extract from which appeared in *Nature* of April 9. The last few years have been most fruitful in mineral syntheses; so much so, indeed, that there remain very few of the more commonly occurring rock-forming minerals which have not been artificially prepared in the laboratory. M. Kroustchoff, who not long ago described a mode of preparing most perfect crystals of quartz, has made many attempts to reproduce hornblende, and has at length succeeded by the adoption of the following somewhat remarkable process. This process essentially consists in digesting together for a long period of time, *in vacuo*, and at a high temperature, the various oxides contained in natural hornblende amphiboles, in presence of water. Small flasks of green glass were employed, each of which was exhausted by means of a Sprengel pump after the introduction of the substances to be digested together. The ingredients digested consisted of (1) a dialyzed three-per-cent aqueous solution of silica; (2) an aqueous solution of alumina obtained by dissolving aluminum hydrate in an aqueous solution of aluminum chloride, and subjecting the solution to dialysis; (3) an aqueous solution of ferric oxide obtained by the addition of ammonium carbonate to ferric chloride in such quantity as to redissolve the precipitate first formed, and dialyzing the solution; (4) carefully prepared pure ferrous hydrate; (5) lime-water; (6) freshly precipitated hydrate of magnesia; and (7) a few drops of caustic soda and potash. The mixture presented the appearance of a gelatinous mud. The exhausted and sealed flasks were placed in a specially constructed iron many-chambered furnace, and heated for three months to a temperature of 550° C. At the expiration of this time the appearance of the contents had entirely changed, having become much darker in color; and distributed throughout were numerous brilliant little crystals, almost black in color, and reminding one forcibly of natural hornblende. On systematic examination, they were found to consist of flattened prisms identical in character with hornblende. Under the microscope they exhibited the hornblende yellowish-green color and pleochroism. Their index of refraction was the same as that of natural hornblende, about 1.65. The angle between their optic axes was found to be 82° ; that of natural crystals varies from 80° to 85° . Analyses gave the characteristic amphibolic percentages, that of SiO_2 being 42.3. In addition to these crystals of hornblende, it is interesting to note that pyroxenic crystals resembling those of the augite family were also found in the flasks, together with crystals of a zeolite and of a variety of orthoclase feldspar; and, finally, some exquisite little quartz crystals were observed, showing cavities containing liquids and bubbles resembling those of natural rock crystals.

— Welch, Fracker Company, New York, have in preparation "Ohio in Art," by Francis C. Sessions, president of the Ohio Archaeological and Historical Society, to be illustrated with etchings, photogravures, and many smaller cuts, reproduced from the most notable works of Ohio artists. Among these may be named Otto H. Bacher, James Beard, W. H. Beard, Robert Blum, Theo. E. Butler, Thomas Cole, Kenyon Cox, Charles C. Curran, John J. Enneking, C. H. Eaton, E. Peixotto, Hiram Powers, J. H. Twachtman, Edgar M. Ward, J. Quincy Ward; to be sold by subscription only.

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Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer: not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinion expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

THE DESTRUCTION OF THE WAVE THEORY.

At brief intervals of time the scientific world is startled by the announcement that some one of its favorite and supposed permanent and well-established theories in science is annihilated by a new genius in the field of research. On investigation, however, it has thus far invariably proved that the supposed iconoclast is slightly in error; and the theory usually stands firmly until another bold martyr appears to shake but not to overthrow it. The last of these brave but unknown and unknowing martyrs to science, as we fear, may be found quixotically attacking the wave theory of sound in the columns of the *Monthly Journal of the British Society of Musicians*, in the issues of March and April.

Mr. George Audsley supports the "substantial" theory of sound with courage, if not with knowledge and discretion, and puts to flight such advocates of the old notion of vibration as Professor Tyndall in Britain and Professor Mayer in America; at least, those gentlemen seem not to have remained on the field of battle. Mr. Audsley points out the fact that the stridulations of the locust affect the air for miles around, remaining audible even when reduced four thousand millions of times, and takes this as ample and positive proof of the folly of the accepted theory, a *reductio ad absurdum*, in some sense, certainly, beyond the suspicion of a question. Unfortunately he has no exact measurements and no accounts to give us of experimental research to sustain his onslaught; but that fact seems to him unimportant.

Scientific authority in the United States comes to the support of Mr. Audsley also. "Professor" E. J. Drake, presumably an authority, and accomplished in experimental investigation, — although we lament that we must confess our ignorance on this subject, never having heard of these "authorities" at such meetings of the learned societies as we have had the good fortune to attend, — gives Mr. Audsley the benefit of his victory over Professor Tyndall, and the "startling" results of experiments at the Pennsylvania Military Academy by Capt. Carter as related to Professor Tyndall, without, unfortunately, convincing that hard-headed "scientist," who replies only thus: "You may go

to rest with the assurance that the wave theory of sound is perfectly secure."

Mr. Sedley Taylor ventures to mildly uphold the endangered theory, however, and presents very admirably what little can be said in favor of the sound-wave; but both he and Tyndall, and presumably Mayer, are met by the somewhat intimidating accusation of "scientific cowardice," and, it is feared, may be driven from the field, leaving the sound-wave theory to stand as best it can.

Nevertheless, every one studying the physical sciences will be interested in learning who these bold soldiers of a forlorn hope be, and what is the experimental evidence on which they rely. Truth must in the end prevail; and it is only necessary to secure experimental evidence of the new ideas to insure their acceptance. Facts, not words, are needed. What man of science of known ability and experience in research will be the first to prove the material theory of energy-transmission through elastic substance? Messrs. Audsley and Drake are with him, and will bravely claim for him deserved honor.

If we may venture the suggestion, however, to such able and learned men as are engaged in this grand crusade, we would modestly intimate the possibility that the trouble is not so much with the wave or any other "theory" as with the facts; not that one or another explanation of the *modus operandi* is unsatisfactory, but that a minute insect can, by any natural process, shake such enormous masses. Is it not, after all, a miracle which our bold crusaders have discovered?

UNIVERSITY EXTENSION. — HISTORY OF THE PHILADELPHIA LOCAL MOVEMENT.¹

THE success of the university extension movement in England has been closely watched by those interested in higher education in this country for a number of years; but, as the problems here presented were in many respects radically different, there has been a great feeling of hesitancy anent the initiation of the work in this country.

Before any general movement was attempted, it seemed advisable that an experiment should be made in some one place, and a thorough test had. To secure this end, an informal meeting was held in Philadelphia early in the spring of 1890, at the request of the provost of the University of Pennsylvania, to discuss the feasibility of transplanting the English system. It was seen at once that Philadelphia and its immediate vicinity offered, as a place in which to try the experiment, advantages possessed by no other. Here was a compact city made up of parts originally independent: here were in close proximity not only flourishing suburbs, but a large number of towns and villages; and last, but not by any means the least important, in this field, there were found more institutions for higher education with which it would be possible to co-operate than in any other section of the country.

Immediately it was resolved to make the experiment, and the first step was the organization of the society. The co-operation of the teaching bodies in and adjacent to the field was asked, and it became evident from the hearty responses received on all hands that there would be sufficient teaching force available for the work. The next step was to invite the co-operation of existing bodies interested in liberal culture. Again the hearty responses received, in a measure foreshadowed the successful inauguration of the work.

It was then resolved to send the secretary abroad to make a study of the movement at its fountain head. During his sojourn in England, he made a careful examination into the plans of organization and method of work of the Cambridge Syndicate, the Oxford Delegacy, the Victoria University, and The London Society for the Extension of University Teaching. Upon his return

¹ From Bulletin No. 1 of the American Society for the Extension of University Teaching.

in the fall, he drew up a careful report, which was printed, and may be had on application. The organization of the "local centres," as they are called, was at once actively entered upon.

In organizing these local centres, the society endeavors to co-operate with, and as far as possible work through, existing institutions. In almost every case we have found some organization which possessed a hall, and was willing to take up the work, and to grant the use of the hall rent-free. The first centre established was that at Roxborough, in connection with the St. Timothy's Workingmen's Club and Institute. They opened their first course on chemistry on the 3d of November, 1890.

The following is a list of the centres that have been established, and the courses in progress at the same: Wagner Institute, zoölogy, chemistry, geology, psychology, and two courses in English literature; Association Local Centre, in connection with the main branch of the Young Men's Christian Association, astronomy, biology, higher mathematics, and two courses in English literature; West Philadelphia, American history and English literature; Frankford, American history and English literature; Holmesburg, American history and English literature; Germantown, English literature and electricity; Spring Garden, mathematics and two courses in English literature; Wissahickon Heights, English literature and European history; South Broad Street, American history and electricity; Women's Christian Association, biology; United Club and Institute, English literature; Norristown, two courses in English literature; Camden, N.J., English literature; Lansdowne, electricity; Media, English literature; Haddonfield, N.J., European history; Newark, Del., English literature; Mount Holly, N.J., American history; Downingtown, Penn., English literature; Trenton, N.J., English literature; Wilmington, Del., English literature.

To summarize what has been done thus far, there have been forty courses, with an average attendance of 9,250 (estimated), and two hundred and fifty lectures, with a total attendance of 55,500 (estimated).

Applications for the formation of local centres have also been received from Salem, N.J.; Bryn Mawr, Penn.; Reading, Penn.; Bristol, Penn.; Gloucester, N.J.; Woodbury, N.J.; Woodbourne, Penn.; Williamsport, Penn.; Wilkesbarre, Penn.; West Chester, Penn.; Lebanon, Penn.; Towanda, Penn.; Collegeville, Penn.; Rahway, N.J.; Doylestown, Penn.; Hazleton, Penn.; Lancaster, Penn.; Bridgeton, N.J.; Pottstown, Penn.; North Wales, Penn.; and Staten Island, N.Y.

The courses vary in length from six to twelve lectures. The method adopted is, first, to have the lectures last about an hour, after which the students form themselves into a class to pursue the subject further. In connection with each course there is issued a syllabus, giving a full outline of the lectures, together with suggested lines for collateral reading. In addition to this, it also contains at the end of each lecture a series of exercises, which the student prepares at home and mails to the lecturer, who returns them at the following class with his comments noted on the margin. At the end of each course an examination is held, upon the basis of which, together with the weekly paper work, certificates are awarded.

This short statement gives the public a fair idea of our general work as we have entered upon it and carried it out. It is hoped that general interest will be felt in this plain statement of facts regarding a novel attempt at higher education with its surprisingly successful results. We desire also to state what is our main aim in this university extension work. It has been too long the system to keep university forces, teaching, and methods shut up entirely within classrooms, and to leave the great mass of people without the opportunities of having their minds fertilized with great thoughts, their studies carefully guided, and their knowledge lifted from a lower to a higher plane by this systematic university teaching; for it must be noted especially that the teaching contemplated in this movement is of real university grade, conducted by teachers of the first rank, and by methods which have proved themselves capable of giving results fairly comparable with those obtained within academic halls.

We propose, then, to carry this university work out into the general community as far as practicable. It will afford to all,

however pressed with practical duties, or hindered by lack of funds, the opportunity of acquiring recent and exact knowledge, and of sharing in the stimulating discipline of genuine educational methods. These methods adopted by the society are flexible, and well adapted to the objects in view.

The society aims to make its local centres self-supporting. With proper efforts at each centre, this can usually be accomplished; but it is evident, that despite this, and despite the generous co-operation of many eminent teachers, large expenditures of money will be required.

We are happy to announce that the continuance of the work is secured by a liberal guaranty fund for five years. It is, however, believed that all will recognize this new national educational movement as judicious as well as generous, and that its claims will appeal forcibly to very many minds. It is earnestly hoped that all who realize its importance will become members of the society, and assist in the development of the work.

MICHIGAN STATE SANITATION.

THE annual meeting of the Michigan State Board of Health was held April 14 1891. Professor Fall, Drs. Avery, Hazlewood, Vaughan, and Baker, were present. Dr. Avery was re-elected president. Dr. Vaughan reported that at the State Laboratory of Hygiene he has made analyses of all the different kinds of baking-powder found in the market, also of one hundred and twelve samples of water from different parts of the State, and that he was ready to report the results, also of his researches on typhoid-fever. Dr. Baker reported that he had worked out the cause of influenza. He said its greatly increased prevalence during the last three months is alarming, because so many other diseases follow that disease, and increase after it increases; the diseases which so increase being consumption, pneumonia, cerebro-spinal meningitis, rheumatism, osteo-myelitis, etc., influenza seeming to bring in its train all of these most important diseases. Dr. Baker explained the causation of influenza. He stated that the germs of influenza are generally at all times present, and the germs of pneumonia, tuberculosis, and of the other specific diseases are somewhat widely disseminated, but that there must be certain coincident meteorological conditions to irritate the throat and air-passages sufficiently to let the germs gain an entrance to the body. These meteorological conditions, in this instance, were the excessive prevalence of north and north-east winds, and the excessive amount of ozone during the past three months. The prevention of influenza, and of the coincident rise in the other more dangerous diseases, has not been possible, because of ignorance of the causes. Now the causes are known, and the study of the measures for the prevention can begin. How to get more thorough disinfection after contagious diseases, was brought up by Dr. Hazlewood, also by letter from Dr. Nicholson of the Upper Peninsula, and also by other correspondence of the office of the board. It seems to be made plain, that, if the bill now before the Legislature (Senate Bill 257, House Bill 640) shall become a law, making a small appropriation to enable the State Board of Health to send an inspector to the localities where most needed, to aid in the final disinfection after cases of dangerous diseases, the spread of those diseases can be very greatly lessened, and hundreds, and possibly thousands, of lives can be saved in Michigan in every year.

PORCELAIN INDUSTRY IN FRANCE.

THE United States consul at Limoges says, in his last report to the United States Government, that the proprietors of the large porcelain-factories there have been for a long time studying the question of reducing the price of fuel. At a recent congress of the manufacturers, it was said that some new and cheap way of manufacturing porcelain must be found for France, or the industry which has become so famous, and which employs so many of the inhabitants, would be driven from French soil on account of the cost of firing. It was there ascertained that the cost of firing china in Bohemia was not more than 10 francs a ton; in England it was only 13 francs; while, for the same thing in France, at Limoges, the cost was between 34 and 35 francs. This difference

being so great, and making it impossible for the French manufacturers to make their china as cheaply as their foreign neighbors, various devices have been tried, but with little success. In order to compete, wages have been reduced to the lowest point, and still the manufacturers are said to have lost money. The coal that is employed is necessarily costly, as a smokeless, long-flame variety is required. Many of the factories burn wood only, as that produces a purer white than the very best kinds of coal; but wood is dearer than coal. It is consequently only used in firing the muffles, and in the finest grades of porcelain. A few years ago a new process was tried, that baked the porcelain in a short time; but the cost made the process impracticable. It was under such circumstances as these that one of the most progressive houses in Limoges was induced to employ petroleum or residuum oils as a fuel, to accomplish which, an American firm using the Wright burner was requested to make a trial with the fuel. There was very much doubt and fear connected with the experiment; but after a time it was attempted, and the results were far better than anticipated. The heat was shown to be absolutely pure. No gases or smoke in any way discolored the china, which came from the kiln much whiter, and in better condition, than when it is fired with the best of wood. In the muffles there was a decided advantage. The delicate colors, which show at once the presence of the slightest quantity of gas, were perfect. "This new discovery," says Consul Griffin, "promises to revolutionize the whole porcelain industry." It is estimated, that, by employing these oils, there will be a reduction of about 15 or 20 per cent in the making of china. The only question now is the present classification of residuum oils in the customs tariff, as the present duty on petroleum — 120 francs per ton — is prohibitive; but strong pressure is being brought to bear on the French Government to have fuel oils classified as fuel, which pays only 1 franc 30 centimes a ton. New life is given to an industry that was seriously threatened; and it is hoped that the French porcelain will be brought to a greater state of perfection by this new American invention.

MEXICAN ARCHÆOLOGY.

MR. CARL LUMHOLTZ writes, "Since I wrote last, I have had an interesting though sometimes rather rough time of it, crossing Sierra Madre in December and January. We had snow several times, and the grass is of poor quality, so I lost altogether thirteen of my animals. There are three Sierras to cross at an elevation of about nine thousand feet: you may therefore easily imagine what a rough country it is to traverse in the winter-time, making our own trails. I had thirty men and about a hundred animals, and I pulled through all right. My camp is now near Casas Grandes in Chihuahua, where my animals are resting. The scientific result is very satisfactory so far. The most interesting things I came across were some wonderfully well-preserved skeletons in a series of caves. In some of the caves were small villages; others were reserved as burial-places, and here I dug out several of the above-mentioned skeletons, the porphyry pulp having preserved for centuries the corpses so well as to be made into some kind of mummies. The features on some are complete, even hair and eyebrows still there. These people were of small stature, and bear a striking resemblance to the Moqui Indians of the present day. In the eastern slopes of Sierra Madre I also dug out many mounds, and every day brought to light fine stone implements and beautiful pottery. I might profitably spend two years in excavating mounds only; but I am going on with this kind of work only till the end of April, when I start out again in the mountains. Among the fossils found on the western slopes of Sierra Madre, near Nacory, is a huge horn six feet eight inches long and twenty-six inches at the largest circumference, probably belonging to some extinct bison. Many birds and plants (about two thousand) were found. I am entirely confident of the success of the expedition. Next time you will hear that I have found people alive in the caves. There is a wonderfully rich field before me, and I know that my expedition will bring greater results than anybody at present anticipates. But the expenses are far greater than I expected. My animals only cost three thousand dollars. In December and January I paid wages each month, re-

spectively, \$1,000 and \$1,025. I mean to reduce my force; but a small party cannot well travel here, as there are plenty of Apaches, and farther south any amount of bandits that are equally bad. I now have a fine gang of men and every thing in regard to outfit complete, speak Spanish fairly well, am on excellent terms with the Mexican Government (they imprisoned lately for three years an inspector who stopped my provisions last fall), and the field before me is of exciting interest. But more material support will be needed, if I shall not have to go just with two or three men. Still, I am determined to do even that, because I must accomplish my aim. I am now on a fortnight's trip to the United States to see some friends that I think may give me further support, and on the 26th or 28th of April I expect to be on the march again."

HEALTH MATTERS.

Influence of Exercise on Digestion.

DR. STRENG, in a lecture before the Medical Society of Giessen, on "The Influence of Exercise on Digestion," an abstract of which appeared in the *Lancet* for March 7, states that he concludes from his own experiments that this influence is of a retarding nature. His experiments, however, suffer from the fact that he always injected 300 cubic centimetres of water before obtaining the contents of the stomach, so that the proportion between gastric juice and water continually varied. The first experiments in the clinic at Giessen were made on two dogs. Twenty-five grams of meat suspended in 300 cubic centimetres of warm water were twice injected into the fasting stomach; and after one feeding, the dogs were compelled to remain for three hours in absolute bodily rest, while after the other feeding they were made to take active exercise. After the three hours, the contents of the stomach were obtained and analyzed. The quantity did not essentially differ in the two cases: the experiments consequently tended to prove that exercise does not influence the time required for digestion. The chemical analysis also detected no difference. The same results were obtained by substituting the white of an egg for the meat. The experiments were then repeated twenty-five times on three men with healthy stomachs. Two of these suffered from sycosis, and the third from insipient muscular atrophy. They were fed each time with 200 grams of minced meat, a bun, a plate of bouillon, and three spoonfuls of mashed potatoes, and the contents of their stomachs were obtained four hours and a half afterwards. The exercise after meals consisted partly in gymnastics, partly in walking. Absolute rest was obtained in bed. These experiments gave the same results as those on the dogs, the difference resulting from the chemical analysis being especially imperceptible. The author therefore concludes that the gastric function is in no way influenced either by muscular action or by absolute rest.

LETTERS TO THE EDITOR.

* * * Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

The Pollination of Zea Mays.

THE brief report, in *Science* of March 27, of the interesting experiments with American corn at Cornell University does not give the results of the control tests, and thus fails to prove that removing a number of the tassels from a corn-field increases the yield of the emasculated stalks. The standard given for comparison is the yield of certain stalks under abnormal conditions.

The experiments of Darwin, Gaertner, and others, make it probable that the fertilization of a monoecious organism with the male element of another individual of the same species increases the vigor of the progeny, and, conversely, that self-fertilization either results in sterility or a weakened progeny.

Applying this biological law to the corn-field in question, it might be claimed that the stalks which were allowed to tassel were self-fertilized to an abnormal degree, and thus were weak-

ened, reducing their yield below the normal. It might be claimed also that from the reduced amount of pollen, and the shock of the injury, the yield of the emasculated stalks was also reduced below the normal, and thus that removing the tassels really reduced the yield.

All claims of decrease or increase rest on mere probabilities, unless the control experiments are known. The produce of a like number of rows in the corresponding situations on the other side of the corn-field would give the normal yield. Simpler, though less accurate, the average yield of the untreated portion of the general field would suffice for a standard.

The great number of undeveloped grains on the ears of isolated corn-stalks and on the borders of fields may be due to self-fertilization; but, as a like frequency of undeveloped grains occurs on the cobs of corn whose tassels have been blasted by the western hot winds, the non-development may be due to lack of pollen.

As it does not seem reasonable that there was any lack of pollination in the Cornell University corn-field, the results of the control experiments may prove the claimed increased yield, and may also be another proof of the injury of self-fertilization. But these results may show that the decreased yield of the abnormally self-fertilized stalks more than counterbalances the increased product of the maimed stalks.

DICE McLAREN.

Baltimore, March 31.

Homœopathy in Relation to the Koch Controversy.¹

EVEN the authority of Dr. Koch's eminent services has been unable to uphold parataloid in the terrible search-light of the Virchow and Chiari necropsies; and it is questioned whether the reported improvement of Kaposi's cases of lupus promises permanent cure in that form of tuberculous disease. Experience with Koch's fluid in this country has afforded results no more favorable. Koch, nevertheless, hopes "to extract from the tubercle bacillus its curative substance alone," and there remains on all sides enduring hope that true curative power can be liberated from the parataloid.²

Is it generally known that the homœopathic school has for many years made use serviceably, not poisonously, of Koch's material in the treatment of consumption and other tuberculous disease? For twenty years this most misunderstood and maligned body of observers has recognized the indispensable curative service of the products of disease, and, in addition, the necessity³ for their extreme attenuation, before they might be safely administered in sickness. "Tuberculinum," "anthracin," and "syetoin" belong with such drugs as arsenic, which develops dangerous lesions if given to persons in health, but is curative in certain disturbed conditions. The testimony given by these physicians appears singularly fitting, and their experience would be of vital importance at this time of wholesale experiment threatened by the followers of Koch. I will now attempt to describe the cultus and professional training of these men who are accused by the dominant school of failure to accomplish any thing for medical science, of bigotry, of narrowness, and of "having a fixed belief."⁴

The college requirements for students of homœopathy do not differ materially from those of the older school. Many of these students are already graduates of Harvard or of foreign medical schools, who afterward finish their studies at a homœopathic college.

"By their fruits ye shall know them." Among the noteworthy results of a professional education in the methods of this school

¹ Abstract of a paper by C. F. Nichols, M.D., in *Popular Science News*, April.

² See Report of the Imperial and Royal Society, Vienna; *Medical News*, Jan. 17; *Boston Medical and Surgical Journal*, March 5; *Medical Record*, March 7, 14, 28; *Lancet*, March 28.

³ "Koch usually injects only one-millionth of a gram of the active principle. From the effects of this inconceivably minute quantity some idea may be formed of the almost uncanny energy which the substance would display if let loose, so to speak, in the fulness of its untamed strength" (Sir Morell Mackenzie, in the *Contemporary Review*). "One part to a ninety-eight billionth of the bulk of the whole body in a man weighing fifteen stone," is Dr. Hine's estimate (*London Lancet*, Feb. 14, p. 357).

⁴ See Professor H. C. Wood's Yale address, also addresses published in *Medical and Surgical Reporter*, all previous to November, 1889.

has been the discovery of unexpected remedial agents far in advance of other medical investigators. The homœopaths have long recognized the life resulting from death in natural growths, and have not hesitated to explore filth, decay, and disease for morbid products or nosodes. Diseased material from animals and plants, and the poisonous secretions of reptiles, fishes, and insects, are found to be indispensably curative in desperate or obscure diseases, but are only thus helpful when the powers of each have been clearly differentiated by a thorough proving. Is it generally known what is meant by a proving or study of a remedial agent? Let me, then, briefly show you the labor, the research, and the professional skill required to make a proving.

A proving is made by administering to several healthy persons a substance or extract, and recording its effects, with the ultimate object of using the proven material in disease. Each agent must be studied¹ with regard to its chemical, functional, and the whole pathological effects in the body. Study the pulse, actions of the heart, lungs, brain, kidneys, liver, systems of nerves, blood-vessels, lymphatics, glands, digestive organs, machinery of the senses, each anatomical part and tissue. Study the connection of the proven material with eruptions, parasites, contagions, climates, influences inherited or acquired. Note the resemblance of this to other drugs and its antidotes. Above all, there must be perceptions of mental states, tact to avoid deceit, artistic insight, and quick sight; for all these matters, sought out by stethoscope, ophthalmoscope, sphygmograph, microscope, analyses of the urine, blood, etc., and the whole armentarium of a modern physician, enter into the preparation of a proving, and must be brought together with laborious, painstaking care before the proving is offered.

Professor Constantine Hering prepared in the year 1850, for his colleagues of the medical college at Allentown, Penn., a scheme of twenty closely written pages, — simply directions for epitomizing and recording their provings. The systematic habit of German university training which has given their prestige to German scientists was thus early brought to bear upon students in this matter.

A proving is accepted, and enters materia medica and text-book, only after its characteristics have been confirmed by scores, often by hundreds, of independent observers.

At last the proving stands, full of interest, a new discovery, an elaborate, sometimes a learned analysis, entirely unknown to old-school methods, and one more weapon is ready for use.

The authorized works of homœopathic materia medica are very numerous: fully eleven hundred remedies are available.² Many practising physicians carry in memory the chief characteristics of the greater proportion of these.

Provings, and the repertories founded upon them, naturally differ in value; yet a curious observer must, I think, find in the general result the evidence of such persistent industry and scientific research, that all statements which assume a lack in either respect obviously proceed from uninformed persons.

Regarding attainments in literature and the liberal sciences *per se*, — a welcome addition, no doubt, to the real service of medical men, and the supposed lack of which on the part of these practitioners has been made the subject of grave comment,³ — to four bright spirits only, in all these two thousand years of physicians, have seats been assigned among the immortals. Hippocrates, Galen, Sir Thomas Browne, finally Dr. Holmes, have severally gained a place in letters. Each of these is a rebel and an innovator, for without rebellion and innovation was never yet wrought any good thing. But fifty years have passed since the death of Hahnemann, himself a man whose vast learning was fully recognized in his time.⁴ Meanwhile neither poet nor sage has yet chanced to be "an ornament to his profession." The fact is, its founders have been at work so hard that they have had no time to hold up their heads to sing.

¹ Usually in a so-called college of provers.

² Boenninghausen's *Repertory*, an early publication, might fairly be compared with Roget's *Thesaurus* or a modern lexicon. The recent compendiums (of which three are available) aggregate many hundred pages of closely printed text.

³ See letter in the *London Times*, Jan. 8, 1889; also Dr. D. K. Newell's annual address before the Massachusetts Medical Society, 1890.

⁴ See the writings of Jean Paul Richter and Broussais.

Let us now inquire what has been accomplished for medical science by the elaborate provings of the homœopaths; for the *raison d'être* of a proving has not been explicitly given in the preceding pages. Hippocrates, Hahnemann, and Sydenham hypothesized, and finally taught, that the proving or testing of medicines upon the healthy would show the exact curative power of each remedy in disease. This doctrine was formulated by Hippocrates in the aphorism or axiom *similia similibus curentur* ("cure by similars"). Jenner by vaccination, and Pasteur and Koch by their inoculations, have more recently illustrated the effects, under this hypothesis, of a limited class of remedies; but to Hahnemann and his successors alone, with their elaborate system of full descriptive provings of nearly every known medicinal agent, is due the gradual establishment of a law deduced from the original working hypothesis of Hippocrates.

That the law of similars cannot be explained *a priori* (i.e., upon any material or mechanical grounds) is, to my mind, at once to be admitted before we can accept it as a fundamental principle or starting-point, exactly like that of electricity or chemical force. The law is, that disease is cured by an influence similar to that which produces it. However daring the first assumption of this law of similars, it has now passed through the stages recorded in the history of every established science; i.e., it has been submitted to induction, deduction, and verification.

Mere observation of instances is not inductive, and does not lead to science until, through the study of instances, we rise to fixed law. With such a law, prophecy or deduction must be possible; and the accuracy of this prophecy or verification will be a fresh test of the original law. The homœopathic law, being tested in reference both to normal and the diseased conditions of the human body, has the logical advantage of a double verification, and may thus be said to be rediscovered every day in the practice and provings of each homœopathic physician.¹

It is, then, law, not luck, which has enabled the homœopaths to reach their very consistent results. Their remedies in common use are an emphatic demonstration of the practical value of the law of similars: such as mercurius, which causes eruptions, salivation, and diarrhoea, and is undeniably curative in these forms of disease; quinine, which, causing ague symptoms, relieves them; nitroglycerine, which removes the form of congestive headache inevitably produced by it in a healthy person. And if the imperfect discovery of Koch be, indeed, a conspicuous and brilliant blossom of medical science, it is the startling fact that this law of similars plucked the flower long ago, and, aided by its accessory of safe dilution or attenuation, has made intelligent use of its discovery.

To confine our attention to testimony bearing directly on the treatment of tuberculous disease. The proving of tuberculinum shows, as its primary effect, evidence of a deposit of tubercle at the base of the brain. Severe and unbearable headaches are a prominent symptom, with local congestion, delirium, and insanity; more remotely and as later manifestations, cough, purulent sputa, and diarrhoea. The remedy tuberculinum has been for years helpfully given in meningitis, hereditary and inveterate headaches, hectic fever, night sweats, cough with tuberculous expectoration, and all early stages of phthisical disease.

It would thus appear, that, in those first stages of consumption which alone are claimed to be curable by the injection of Koch's fluid, the homœopaths have made safe yet effective use of the same materia morbi as Koch's.² Instead of protection by boiling, cultivation, etc., a high attenuation has been efficient.³ This attenuation, made chiefly by means of dilute alcohol, is claimed to accomplish something beyond the mere subdivision of material.

¹ "Science presents itself as exact and verified knowledge; . . . if observation and verification cannot demonstrate the real existence of the genus, philosophy itself, in any sane sense of the word, is annihilated" (Dr. F. E. Abbot, *The New Ideal*, May, 1889).

² See *New Organon*, July, 1879, pp. 342, 439, 440; Dr. Swan's *Morbific Products*, 1896; Burnett's *New Cures*, 1885 to 1890; J. A. Biegler's Report; C. Hering's *Guiding Symptoms*, vol. x. (now in press).

³ Attenuations thus far made by the French experimenters have been unsatisfactory, both on account of the uncertain strength of the dilutions, and also by reason of changes of quality wrought by cultivation of the original material. The writer is aware of Koch's statement that the albuminoid principle of parataloid is insoluble in alcohol. The simple dilution of the latter avoids this difficulty, chiefly by checking its coagulative effect.

The irritant particles are mechanically detached, while the curative principle is separated and developed. The degree of attenuation used always ranged as high as a so-called thirtieth potency. After Darwin's statement of the minuteness of the spores of *drosera* capable of producing their characteristic action, the efficiency of a potency or attenuation does not to many persons seem improbable; and we will leave, for the present, the mathematics so frequently discussed.

It will readily be seen, however, that treatment by nosodes might soon degenerate into an enthusiastic, thoughtless, and empirical use of these remedies, to the exclusion of others, if the inference were drawn that each microbic disease could be annihilated by its own potentized product; and it has naturally been found impossible to remove, by the administration of its nosode alone, the whole ultimate disturbance, in the form of secondary symptoms, sequences, and diseases of distant parts of the body. Indeed, other remedies might, even from the beginning of treatment, be more serviceable than these. Thus, in faithful treatment, it is sought to accomplish an end far more subtle than the mechanical removal of bacilli. Holding them to be merely parasites, among which may exist many forms not inimical to health, but even fulfilling protective service in the body, the homœopath does not consider it essential that its bacillus be seen in the atom of diseased material which he prepares for medicinal use (the bacillus would almost necessarily be there, for each characteristic parasite is the carrier of the disease in which it dwells); but it is the deadly material¹ in which the microbe-parasite feeds which alone is desired for proving, finally for prophylaxis and therapeutic use.²

The ancient school attacks the new, having known but little of its large work; but the time has gone by for dismissing without a hearing such claims as led Wilson, the anatomist, to employ homœopathy for himself, and Sir Sidney Ringer to incorporate, *verbatim*, large sections of its materia medica in his authoritative work.

These are the stars in the firmament of homœopathy, — men of affairs, men of business, scholars, warriors, poets, statesmen, whose practical wisdom has moulded the destinies of the world, — Sir William Hamilton, Archbishop Whateley, Carl Wilhelm Siemens, Lord Lyndhurst, Augustus de Morgan, Secretary Seward, Lord Lytton, Charles Reade, Wendell Phillips, Theodore Parker, Helen Jackson, Miss Phelps, Balzac, Gambetta, D'Israeli, Bismarck.

Instead of such awkward use of its weapons that the force powerful enough to combat the disease must destroy also the invalid, homœopathy, *die milde macht*, has quietly employed its methods, "strong enough," as Wendell Phillips once remarked to the writer, "to wait until its accumulating facts would speak for themselves."

C. F. NICHOLS.

Boston, April 15.

Iroquoian Etymologies.

I WISH to make a correction. In my article (*Science*, April 17, 1891), instead of the word *ratikowanên*, on p. 219, second column, at the end of the first paragraph, read *ratikowanên's*. This error was perhaps due to an oversight of the copyist in transcribing with a typewriter from my script notes, and overlooked in revision.

J. N. B. HEWITT.

Washington, D.C., April 19.

BOOK-REVIEWS.

Power through Repose. By ANNIE PAYSON CALL. Boston, Roberts. 16°. \$1.

THE tone and object of this book are thoroughly good. The warning that it sounds is similar to that which Dr. Weir Mitchell so earnestly voiced in his "Wear and Tear." We are wearing and tearing too much and too fast. We are losing the faculty of

¹ The bacillus not only maintains its own parasitic life in the body, but appears itself to manufacture, or subverts the nutrient function to produce various toxic substances which are poisonous, though separated from the bacillus (see *Popular Science News*, March, 1891, p. 43, quoted from *Edinburgh Medical Journal*).

² See Swan's *Nosodes*; Burnett's *New Cures*.

resting, the power of repose. The prevailing disease of our modern steam civilization, so accentuated in our country as to receive the name of "Americanitis," is the result of this constant nervous tension, this restlessness, this craving for mental excitement, this emotional prodigality, this over-absorption in business cares, this over-hurrying and over-worrying which in a thousand forms is exemplified in the lives among which we live. It is certainly timely and proper to call a halt in this mad rush, to make haste more slowly and more wisely for a while, to gain time for a survey of our surroundings and a searching for the best means of adapting ourselves to them,—of getting the most and the best of life, if you will, but without losing the power to enjoy in the very strife for those things by which our pleasure is to be gained.

It is also well to recognize, as the present volume clearly does, that this problem is to be solved by mental and moral discipline quite as much as by physical; or, rather, that the two are in so many respects one. Control over the body is mental control. Right use of body comes through mental health. The modern view of the relation between body and mind finds its support quite as plentifully in the field of disease as in that of normal action. The necessity of treating the two together in order to gain an insight into the nature of the activities whereby we live and move and have our being, is no more cogent than it is in the study of diseased function. It is the psycho-physical organism that we educate, it is the psycho-physical organism that we cure.

But the ways and means of avoiding this mental break-down, this nervous prostration,—what of these? As to the efficacy of the author's answer to this practical question, there will be many opinions. The treatment is elaborately though not always clearly described; but the essence of it is to bring into consciousness the motor evidences of our mental strain, the little nervous twitchings and habits that have so deep a hold on all of us. We must learn to be passive, to utilize the many opportunities of rest that occur. When we sit in a chair, we must sink into it, trust in it, and let it hold us. In riding, we must not worry about how fast we are going: we must relax all the muscles, and gain power through repose. Our position in sleep must be as unconstrained as that of a child. When called upon to endure pain, we must yield to it and have it over, not restrain and check with the risk of a disastrous explosion later. If we have so far strayed from the path of physical rectitude as to be oblivious of our erring state, we have a course of special exercises prescribed for restoring the consciousness of our faults, and all this applies as well to mental as to bodily habits.

While agreeing with the desirability of the end to be secured, and in certain cases the utility of the steps prescribed, we cannot but question whether our author is not mistaking a symptom for a cause, and is treating but one factor of a much more complex ailment; whether, too, her enthusiasm does not overestimate what can be done by will alone. This is not, however, a "fad-dist" work (although Delsarte is mentioned more than once): it is a serious statement of a serious problem. The remedy, however suggestive, is certainly incomplete. There are many whom the reading of this work and the obedience to its advice will greatly benefit, and it goes out upon its mission with the well-wishes of all interested in securing and maintaining mental and physical health.

Wörterbuch des Runa Simi, oder der Keshua Sprache. Von Dr. E. W. MIDDENDORF. Leipzig, 1890. 8°.

Das Runa Simi oder die Keshua Sprache, wie sie gegenwärtig in der Provinz von Cusco gesprochen wird. Von Dr. E. W. MIDDENDORF. Leipzig, 1890.

Ollanta, ein Drama der Keshua-Sprache. Uebersetzt von Dr. E. W. MIDDENDORF. Leipzig, 1890.

Dramatische und Lyrische Dichtungen der Keshua-Sprache. Gesammelt und uebersetzt von Dr. E. W. MIDDENDORF. Leipzig, 1891.

It is, we believe, without precedent to find nearly two thousand pages, printed within one year, devoted to the literature of a single American language. This is the extraordinary task which Dr.

Middendorf set before him, and which he has admirably accomplished.

The Kechua, known locally as the *runa simi* (or "language of the people"), is that spoken by the distinctively Peruvian-stock, and, next to the Nahuatl of Mexico and the Maya of Central America, offers the most extensive literary remains of any American tongue. During a residence of five and twenty years in Peru, Dr. Middendorf pursued its study with zeal, and collected all the fragments of its literature which he learned about. These, together with a grammar and dictionary, both well prepared, are included in the volumes before us.

First among these fragments should be placed the Ollanta drama, which had already been edited and translated into German by Von Tschudi, into English by Markham, into French by Pacheco Zagarra, and into Spanish by several authors. All these have leaned to the opinion that it was a native composition dating from before the conquest; but Middendorf gives various reasons for regarding it as a much later production, though probably based on an authentic aboriginal play. He also gives the full text, with translations, of two Kechua sacred dramas,— "The Lost Son," and "Usca Paukat,"—written undoubtedly by natives, and therefore correct specimens of the language, though, of course, later than the conquest. To these he adds a number of poems and prose writings, thus furnishing a very satisfactory mass of material for the study of the tongue in both its ancient and modern form.

While we have nothing but praise for these features of his work, we must lower the note in speaking of his remarks on the laws, customs, and culture of the ancient Peruvians. It is clear that on these branches he has not studied the best authorities, and is far from understanding accurately the state system of the Incas. No one has analyzed this so well as our fellow-countryman, Dr. Gustav Brühl of Cincinnati, and it is to be regretted that Dr. Middendorf did not acquaint himself with the writings of that able Americanist.

The works we have named at the outset are but a part of the praiseworthy plan which Dr. Middendorf has announced. He intends to follow them in rapid succession with as complete an exposition of the languages and literatures of the Aymaras and the Yuncas (or Chimus), the two other semi-civilized nationalities of ancient Peru. We congratulate him on his enthusiasm and enlightened devotion to this neglected branch of human learning, and hope that his efforts will meet with liberal encouragement in this and other countries.

The Historic Note-Book. By E. COBHAM BREWER. Philadelphia, Lippincott. 8°.

MR. BREWER, who had previously given to the public several small cyclopædias, now offers another of a somewhat different character. It is not a dictionary of dates, nor is it an alphabetical list of the main events of history: on the contrary, the main events are for the most part ignored or lightly treated. It is, as the author himself says, "not an historic dictionary, but a dictionary of historic terms and phrases, jottings of odds and ends of history, which historians leave in the cold or only incidentally mention:" hence it contains a great many items that would be hard to find in the ordinary histories or cyclopædias. Some of these items are political, others religious and ecclesiastical, while others still relate to literature, art, commerce, and various other topics. Kings and other prominent personages also claim a share of attention, and the book contains many interesting and amusing anecdotes. Sometimes, as in the articles on "Council," "Constitution and Massacre," a good deal of useful information is conveyed; and there is an appendix containing a list of the more important battles. We noticed, as we looked the book over, some inaccuracies; as, for instance, the statement that Harvard College was founded by John Harvard, and the statement in the article on "Languages" that German is spoken by a hundred million people. Some of the author's remarks on political matters are not in good taste, being too strongly tinged with partisanship; but the book will be useful to students of history and literature, and will give them a good deal of information not readily accessible elsewhere.

Zoological Articles contributed to the Encyclopædia Britannica.

By E. RAY LANKESTER, W. J. SOLLAS, A. A. W. HUBRECHT, L. VON GRAFF, A. G. BOURNE, and W. A. HERDMAN. New York, Scribner. 4°. \$5.

THE title of this volume is misleading, as there is extremely little zoölogy in the articles contained in it; at least, in the sense in which the term "zoölogy" is now most commonly used. It is really a series of summaries of the views on the morphology of the groups enumerated, which, at the time of publication, were held by the contributors. The articles, which appeared at intervals between 1880 and the end of 1888, following the alphabetic order of the volumes in which they were originally printed, comprise *Hydrozoa*, *Mollusca*, *Nemertines*, *Planarians*, *Polyzoa*, *Protozoa*, *Rotifera*, sponges, *Tunicata*, and *Vertebrata*. The later articles are, of course, those which the subsequent progress of science has least outstripped. Those by Messrs. Herdman, Hubrecht, and Von Graff, since the writers are recognized authorities on the topics assigned them, would, in any event, represent a very high standard of opinion. The older articles, especially that on the *Protozoa*, by no means represent the present state of scientific opinion; while that on the *Mollusca*, as shown in these columns at the time of its original publication, was an extremely imperfect production. Over its hazardous speculations time had thrown a kindly mantle, until this reprint recalled them to the

glimpses of the moon. Even Professor Lankester now admits, in view of the testimony offered by one of his pupils, that naturalists from Cuvier to Fischer were right in separating, and that he was wrong in uniting, the pteropods and cephalopods, something which not over half a dozen persons have ever doubted.

But it would be unfair to the authors, and to those who might be able to profit by this volume, to insist too strongly on the defects or deficiencies of these papers. It being once understood that the papers are almost exclusively morphological, and represent the opinions of Professor Lankester and the school of which he is the recognized exponent, biologists generally will require no further guide to the quality of their merits or shortcomings.

For the lay reader or youthful and inexperienced student, this book is undesirable. Only those thoroughly familiar with the branches to which it refers can get a full measure of profit out of its mingled science and speculation. To others it must prove confusing. But it will be welcome to the library of the morphologist and specialist; useful, through its bibliographies, to those who would refer to previous morphological literature; and, in some instances, may serve as an "awful example" to those whose tendency to speculate outruns their knowledge of the subject.

It is handsomely printed, but the absence of an index is a fault for which, under the circumstances, it seems difficult to account.

Publications received at Editor's Office,
April 6-18.

- AVELING, E. An Introduction to the Study of Botany. London, Swan Sonnenschein & Co. 363 p. 12°. (New York, Macmillan, \$10.)
BAILEY, L. H. The Nursery-Book: A Complete Guide to the Multiplication and Pollination of Plants. New York, Rural Pub. Co. 304 p. 12°.
GAY, G. E. Business Book-keeping. Boston, Ginn. 93 p. 4°. 75 cents.
LOWELL, P. Noto, An Unexplored Corner of Japan. Boston and New York, Houghton, Mifflin & Co. 261 p. 12°. \$1.25.
MASSACHUSETTS, Examinations by the State Board of Health of the Water Supplies and Inland Waters of, 1887-90. Part I. Report on Water Supply and Sewerage. Boston, State. 857 p. 8°.
TEALL, F. H. The Compounding of English Words. New York, John Ireland. 223 p. 12°. \$1.25.
WILSON, J. V. How to Magnetize; or, Magnetism and Clairvoyance. New ed. New York, Fowler & Wells Co. 104 p. 16°. 25 cents.

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— John Wiley & Sons announce as in preparation "The Mechanical Engineer's Pocket Book," by William Kent.

— Sister Rose Gertrude has written another article for *The Ladies' Home Journal* for June, on "What it is to be a Leper," in which she gives a clear glimpse of leper-life in Molokai, how the disease is contracted, how it is treated and cured, and how the lepers live in their exile.

— D. C. Heath & Co. have in press for early publication an "American Literature for High Schools and Colleges," by Julian Hawthorne and Leonard Lemmon; also "French by Reading," a new French method on the inductive plan, by Louise Seymour Houghton and Mary Houghton.

— Among their books in press, J. B. Lippincott Company announces "The Chemical Analysis of Iron," by Andrew Alexander Blair (new edition); "A Hand-Book of Industrial Organic Chemistry," by S. C. Sadtler; "Tables for the Determination of Minerals," by Persifor Frazer, jun. (new edition, revised and enlarged); "Chambers's Encyclopædia," Vol. VII. (entirely new edition, revised and rewritten).

— Messrs. Macmillan & Co. will publish next week a "Short History of Greek Philosophy," for students and general readers, by Dr. John Marshall, rector of the Royal High School, Edinburgh. The main purpose of this book is to present an account of Greek philosophy which, within strict limits of brevity, shall be at once authentic and interesting,—authentic, as being based on the original works themselves; interesting, as presenting to the ordinary English reader the great thoughts of the greatest men of antiquity, on problems of permanent significance and value, in language freed from technicality and abstruseness.

— T. Fisher Unwin has nearly completed preparations for a "History of the Press." The volumes will deal in the first place with the British press, and afterwards with the continental press and the American. In each case the history of the great journals will be treated in connection equally with the political and social events they have influenced, and the characters and methods of the men who have directed them to these ends. In a few instances a single journal has played a sufficiently conspicuous and important part to furnish abundant materials for a single volume, but in others the general characteristics of a section of the press will combine many newspapers and personalities into one work. The first volume will be devoted to the *Times*, and others have been arranged to treat of "The Provincial Press," "The French Press," "The German Press," "The American Press," and "The Comic Press." The volumes will be issued under the general editorship of Mr. Henry Norman.

— "Spinning Tops" is an interesting and valuable addition to the Romance of Science Series, published in London by the Society for Promoting Christian Knowledge, and in this country by E. & J. B. Young & Co. The volume is an expanded revision of an "operatives' lecture," delivered by Professor John Perry at the British Association meeting at Leeds in 1890. The changes necessitated by the conversion of a lecture illustrated by actual experiments with elaborate apparatus, into a treatise illustrated by engravings and explanatory letterpress, have been carefully made; and the result is a volume that will not only interest the general reader, but also add considerable to his knowledge of some branches of science. Beginning with a description of the behavior of a spinning top, the author goes on step by step to the movements of the earth in space, touching incidentally on the connection between light and magnetism, and the rotation of the plane of polarization, making his points clear at each step by means of apparatus adapted to the purpose.

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